Early Journal Content on JSTOR, Free to Anyone in the World

This article is one of nearly 500,000 scholarly works digitized and made freely available to everyone in the world by JSTOR.

Known as the Early Journal Content, this set of works include research articles, news, letters, and other writings published in more than 200 of the oldest leading academic journals. The works date from the mid-seventeenth to the early twentieth centuries.

We encourage people to read and share the Early Journal Content openly and to tell others that this resource exists. People may post this content online or redistribute in any way for non-commercial purposes.

Read more about Early Journal Content at http://about.jstor.org/participate-jstor/individuals/early-journal-content.

JSTOR is a digital library of academic journals, books, and primary source objects. JSTOR helps people discover, use, and build upon a wide range of content through a powerful research and teaching platform, and preserves this content for future generations. JSTOR is part of ITHAKA, a not-for-profit organization that also includes Ithaka S+R and Portico. For more information about JSTOR, please contact support@jstor.org.

THE ANORTHOSITES OF THE RAINY LAKE REGION.

A NUMBER of eruptive masses rising through the Keewatin (Huronian) schists and schist conglomerates of the Rainy Lake region in western Ontario were mapped and described by Professor A. C. Lawson in 1887, the most interesting group of eruptives occurring along the southern shore of Seine Bay and between Bad Vermilion and Shoal lakes, just to the east.[1] Here very basic and very acid rocks are found associated. The acid members of the group, quartzose granites containing much plagioclase, have been studied somewhat carefully from the fact that they contain important gold-bearing veins, but the barren anorthosites have been neglected. The soda granites, which often weather into the greenish sericite variety, protogine, and have been sheared and metamorphosed into sericitie schists near the quartz veins, have been described by Winchell and Grant[2] and the present writer,[3] and need no detailed mention here. The basic rocks of the group, briefly described as saussuritic gabbro by Lawson, but afterward identified by him as anorthosite,[4] deserve some further mention.

The largest area of anorthosite encloses the southern arms of Bad Vermilion Lake, and surrounds or is bordered by three areas of eruptive granite. Two or three miles to the west, on Seine Bay, a series of points and islands of anorthosite extend, with some interruptions, westward along the southern shore of the bay for about ten miles. The rock is generally white, almost like crystalline limestone, with only a very small proportion of darker minerals occupying spaces between more or less perfect phenocrysts of plagioclase which range in size from a quarter of an inch to a foot in longest diameter. Towards the western end of Bad Vermilion, however, there are points where the green constituent becomes more important, and the rock may be called a porphyritic gabbro.

---

[1] Geol. Sur. Can., Part F, 1887, pp. 56 and 99.

[2] WINCHELL and GRANT, Geol. Nat. Hist. Sur. Minn., 23d Ann. Rep., pp. 58–60.

[3] Ontario Bureau of Mines, 1894, p. 89.

[4] Geol. Nat. Hist. Sur. Minn., Bull. No. 8, 1893, 2d part, p. 7.

Frequently portions of chloritic or sericitic schist have been enclosed by the anorthosite, showing its post-Keewatin age; and occasionally a green massive rock, apparently weathered diabase, is seen, probably portions of massive Keewatin rocks swept off by the molten anorthosite.

The rock, though clearly an anorthosite, presents some points of difference from the typical rocks of the name, so well described by Dr. Adams from the province of Quebec, the feldspars being always white, never purplish in color, and comparatively rarely showing the sheared and granulated character so often found in eastern Canada.[1] The marked tendency toward idiomorphism in the feldspars is apparently unusual in other regions. The loss of the purplish color is no doubt the result of weathering, which has generally progressed rather far, though cleavage surfaces showing twin striations can be found generally. The freshest example studied comes from a hill at the mouth of Seine River.

In the numerous thin sections examined more than nine-tenths of the rock is seen to consist of plagioclase, usually sprinkled with zoisite particles or more or less completely changed to a saussuritic mass. The darker portions lying here and there in angles between the feldspars consist mainly of a fibrous or scaly mineral with parallel or nearly parallel extinction and low double refraction, probably serpentine, but perhaps a member of the chlorite group. Augite was found as a remnant only once, and then was not of the diallage type. No other primary minerals were observed, not even magnetite; and very few secondary ones require to be added to those mentioned, only epidote, probably some albite, and a very little calcite. The feldspars, where fresh enough to study, show broad twinning according to the albite and frequently also the pericline law, the former ranging in angle of extinction from the twin plane between 17° and 37°. The average extinction angle in thin sections from Bad Vermilion Lake is about 24°, and from the mouth of Seine River 32°. The former feldspar is therefore bytownite and the latter anorthite, both more basic than that of the typical anorthosite, which Dr. Adams finds to be labradorite.

---

[1] Ueber das Norian, Separat Abdruck, Neues Jahrbuch für Min., Beilageband VIII; and Can. Rec. Science, Vol. VI, No. 4, p. 190.

In the freshest section studied (783, mouth of Seine River) the large interlocking feldspar individuals often show a thin band of fresh, clear feldspar where one joins the other; and this clear feldspar strip is seen, when examined with a high power, to form a secondary enlargement of the adjoining crystals, the twin striations running out into it. The extinction angles of these secondary feldspar rims vary from 8° to 14°, corresponding to labradorite, so that the later feldspar is more acid than the older. In one case a bytownite crystal has been broken, the parts slightly shifted, and then cemented with labradorite, most of the twin lamellæ running across the strip of cement.

An analysis of a specimen from the mouth of Seine River was made by Mr. William Lawson in the laboratory of the School of Practical Science, Toronto, the results being given in column No. I. In No. II an analysis of anorthosite from Rawdon, Que., made by Sterry Hunt and quoted by Dr. Adams is given for comparison.[1] No. III gives the results of an analysis of granite adjoining the Bad Vermilion anorthosite area, and is the work of Mr. Lawson.

	I	II	III
SiO_2 - - - - - -	46.24	54.45	76.20
Al_2O_3 - - - - -	29.85	28.05	14.41
Fe_2O_3 - - - - - -	1.30	0.45	....
FeO - - - - - -	2.12	....	1.49
MnO - - - - - -	trace	....	....
CaO - - - - - -	16.24	9.68	2.19
MgO - - - - - -	2.41	....	0.65
Na_2O - - - - - -	1.98	6.25	3.32

[1] Ueber das Norian, p. 494.

	I	II	III
K_2O - - - - - -	0.18	1.06	2.44
Co_2 - - - - - -	1.03	(H_2O) 0.55	....
	101.35	100.49	100.70
Sp. Gr. - - - - - -	2.85	2.69	2.65

The low percentage of silica and soda, and the high percentage of lime as compared with the anorthosite from Quebec are notable and correspond to the results of microscopic examination, the specimen from Seine River consisting chiefly of anorthite, and that from Rawdon of labradorite. The specific gravity, 2.85, is very high, perhaps because of the presence of considerable zoisite. The specific gravity of a specimen from Bad Vermilion Lake was determined to be 2.76, corresponding to its slightly more acid character, since it consists of bytownite.

The results of the analysis show that the anorthosite from the mouth of the Seine is one of the most basic of the massive rocks, having about 8 per cent. less silica than the typical rocks of eastern Canada, but it is probably wiser to include it among the anorthosites, since the somewhat more acid rock from Bad Vermilion Lake links it to the eastern ones.

It would perhaps be most logical to name the whole series of rocks consisting essentially of plagioclase anorthosites or plagioclasites,[1] adopting a binomial nomenclature like that tacitly admitted in the classification of other rocks, such as the granites. We should then speak of anorthite, bytownite, and labradorite anorthosites or plagioclasites; and the list might require to be extended to include andesine and oligoclase rocks, perhaps also albite rocks. The albitites described by Turner from California, under the head of syenites, are dike rocks apparently and should perhaps not be classed with the plutonic rocks referred to here.[2] The name anorthosite has priority but has a very tautological sound in the term describing the rock just discussed, anorthite anorthosite.

Lawson looks on the anorthosite and granite areas of Bad

[1] See Viola as quoted by Rosenbusch in Massige Gesteine, Erste Hälfte, p. 298.

[2] American Geologist, June 1896, p. 379, etc.

Vermilion Lake as representing the truncated base of a Keewatin volcano which served as one of the vents for the pyroclastic materials so widely found in the Keewatin rocks of the region, the basic rock coming first and the acid afterwards.[1] In this he is probably not correct, for there is good evidence to show that the anorthosite, which probably solidified under a considerable thickness of superincumbent rock, was so far exposed by denudation that fragments of it could be rolled into bowlders and become part of a conglomerate before the eruption of the granite. The latter rock has sent apophyses into the anorthosite and has pushed its way through a schist conglomerate containing pebbles and bowlders of quartz-porphyry, sandstone, green schist and occasionally also anorthosite quite like some facies of the adjoining mass. Apparently a long interval separated the anorthosite eruption from that of the granite. The sharp segregation of a magma into a basic anorthosite and a very acid granite would in any case be rather surprising.

A. P. COLEMAN.

SCHOOL OF SCIENCE,
Toronto.

---

[1] Geol. Sur. Can., loc. cit.